Complete Summary

GUIDELINE TITLE

Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy.

BIBLIOGRAPHIC SOURCE(S)

King CK, Glass R, Bresee JS, Duggan C. Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy. MMWR Recomm Rep 2003 Nov 21;52(RR-16):1-16. [114 references] PubMed

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Acute gastroenteritis including acute diarrhea and dehydration

GUIDELINE CATEGORY

Management
Treatment

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
Gastroenterology
Infectious Diseases
Nutrition
Pediatrics

INTENDED USERS

Advanced Practice Nurses
Dietitians
Nurses
Physician Assistants
Physicians
Public Health Departments

GUIDELINE OBJECTIVE(S)

- To update the 1992 Centers for Disease Control and Prevention (CDC) recommendations on the management of acute diarrhea in children
- To provide a review of the historical background and physiologic basis for using oral rehydration therapy (ORT)
- To provide recommendations for assessing and managing children with acute diarrhea, including those who have become dehydrated

TARGET POPULATION

Infants and children presenting with symptoms of acute diarrhea and/or dehydration

INTERVENTIONS AND PRACTICES CONSIDERED

Home Management of Acute Diarrhea

1. Initiation of therapy with oral rehydration solutions (ORS)
2. Parental/caregiver education to recognize signs of illness and determine need for medical intervention
3. Referral for evaluation (usually by telephone)

Clinical assessment

1. Detailed history
2. Physical examination
3. Dehydration assessment
4. Laboratory evaluations including:
    - Serum electrolytes
    - Stool, urine, and blood cultures
    - Complete blood counts

Treatment/Management

1. Acute gastroenteritis therapy based on degree of dehydration consisting of:
    - Rehydration therapy
    - Replacement of losses
    - Appropriate nutrition
2. Maintenance dietary therapy
3. Pharmacologic therapy
    - Antimicrobial agents
    - Nonantimicrobial drug therapies (considered but not recommended)
4. Supplemental zinc therapy (considered but not recommended)

5. Functional foods (considered but not recommended)
    - Probiotics
    - Prebiotics

MAJOR OUTCOMES CONSIDERED

- Mortality
- Incidence, severity, and duration of diarrheal disease
- Number of clinic/emergency department visits
- Hospitalization rates

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases
Searches of Unpublished Data

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Relevant literature was identified through an extensive MEDLINE search by using related terms. Articles were then reviewed for their relevance to pediatric practice, with emphasis on United States populations. Unpublished references were sought from the external consultants and other researchers.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review
Review of Published Meta-Analyses

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Comparison with Guidelines from Other Groups
External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Recommendations of Others: Recommendations related to oral rehydration therapy from the following groups were discussed: the World Health Organization; the American Academy of Pediatrics and the United Nations Children's Fund.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Home Management of Acute Diarrhea

Treatment with oral rehydration solution (ORS) is simple and enables management of uncomplicated cases of diarrhea at home, regardless of etiologic agent. As long as caregivers are instructed properly regarding signs of dehydration or are able to determine when children appear markedly ill or appear not to be responding to treatment, therapy should begin at home.

Initiation of Therapy

In all cultures, treatment of diarrhea usually begins at home. All families should be encouraged to have a supply of ORS in the home at all times and to start therapy with a commercially available ORS product as soon as diarrhea begins. Although producing a homemade solution with appropriate concentrations of glucose and sodium is possible, serious errors can occur; thus, standard commercial oral rehydration preparations should be recommended where they are readily available and attainable. The most crucial aspect underlying home management of diarrhea is the need to replace fluid losses and to maintain

adequate nutrient intake. Regardless of the fluid used, an age-appropriate diet should also be given. Infants should be offered more frequent breast or bottle feedings, and older children should be given more fluids.

Severity Assessment

Caregivers should be trained to recognize signs of illness or treatment failure that necessitate medical intervention. Infants with acute diarrhea are more prone to becoming dehydrated than are older children, because they have a higher body surface-to-volume ratio, a higher metabolic rate, relatively smaller fluid reserves, and they are dependent on others for fluid. For this reason, parents of infants with diarrhea should promptly seek medical evaluation as soon as the child appears to be in distress (see Box 1 in the original guideline document).

No guidelines have established a specific age under which evaluation is mandated, but usually, the smaller the child, the lower the threshold for health-care provider assessment. When fever is present, infants and children should be evaluated to rule out other serious illnesses (e.g., sepsis and meningitis). Underlying conditions, including premature birth, metabolic and renal disorders, immune compromise, or recent recovery from surgery, might prompt early evaluation, as might concurrent illness, including a concurrent respiratory tract infection. Children with dysentery (blood or mucus in stool) or prolonged diarrhea (lasting >14 days) should be evaluated because stool cultures and antimicrobial therapy might be indicated.

Reports from parents or other caregivers of dehydration can indicate the need for immediate health-care provider evaluation. Reports of changing mental status are of particular concern. When the child´s condition is in doubt, immediate evaluation by a health-care professional should be recommended. Clinical examination of the child provides an opportunity for physical assessment, including vital signs, degree of dehydration, and a more detailed history, and for providing better instructions to the caregivers.

Referral for Evaluation

In developed countries, the decision whether to bring a child to an office or emergency department (ED) setting for evaluation is usually made after consultation with a physician or other health-care provider by telephone. Questions should focus on those factors putting a child at risk for dehydration. Whenever possible, quantification is helpful. The clinician should determine how many hours or days the child has been ill, the number of episodes of diarrhea or vomiting, and the apparent volume of fluid output. The child´s mental status should be determined. Parents and other caregivers might not mention underlying conditions without prompting; therefore, questions from the healthcare provider regarding past medical history are essential.

Clinical Assessment

Diarrhea is characterized by the passage of loose or watery stools; a common case definition of acute diarrhea is $\geq$3 loose or watery stools/day. The volume of fluid lost through stools can vary from 5 mL/kg body weight/day (approximately normal) to $\geq$200 mL/kg body weight/day. Dehydration and electrolyte losses

associated with untreated diarrhea cause the primary morbidity of acute gastroenteritis. Diarrhea can be among the initial signs of nongastrointestinal tract illnesses, including meningitis, bacterial sepsis, pneumonia, otitis media, and urinary tract infection. Vomiting alone can be the first symptom of metabolic disorders, congestive heart failure, toxic agent ingestion, or trauma. To rule out other serious illnesses, a detailed history and physical examination should be performed as part of the evaluation of all children with acute gastroenteritis.

History

The clinical history should assess the onset, frequency, quantity, and character (i.e., the presence of bile, blood, or mucus) of vomiting and diarrhea. Recent oral intake, including breast milk and other fluids and food; urine output; weight before illness; and associated symptoms, including fever or changes in mental status, should be noted. The past medical history should identify underlying medical problems, history of other recent infections, medications, and human immunodeficiency virus (HIV) status. A relevant social history can include the number and nature of caregivers, which can affect instructions regarding follow-up care.

Physical Examination

As part of the physical examination, an accurate body weight must be obtained, along with temperature, heart rate, respiratory rate, and blood pressure. When recent premorbid weight is unknown but a previous growth curve is available, an estimate of fluid loss can be obtained by subtracting current weight from expected weight as determined on the basis of the previous weight-for-age percentile. The quality of this estimate will vary, depending on the number and variability of prior data points, differences among scales, and other factors. The general condition of the patient should be assessed, with special concern given to infants and children who appear listless, apathetic, or less reactive. The appearance of the eyes should be noted, including the degree to which they are sunken and the presence or absence of tears. The condition of the lips, mouth, and tongue will yield critical clues regarding the degree of dehydration, even if the patient has taken fluid recently. Deep respirations can be indicative of metabolic acidosis. Faint or absent bowel sounds can indicate hypokalemia. Examination of the extremities should be included because general perfusion and capillary refill can help in assessment of dehydration. An especially valid sign is the presence of prolonged skin tenting. Visual examination of stool can confirm abnormal consistency and determine the presence of blood or mucus.

Dehydration Assessment

Certain clinical signs and symptoms can quantify the extent of a patient's dehydration (see below). Assessment of the anterior fontanel might be helpful in selected instances, but it can be unreliable or misleading. Among infants and children, a decrease in blood pressure is a late sign of dehydration that heralds shock and can correspond to fluid deficits >10%. Increases in heart rate and reduced peripheral perfusion can be more sensitive indicators of moderate dehydration, although both can be difficult to interpret because they can vary with the degree of fever. Decreased urine output is a sensitive but nonspecific sign. Urine output might be difficult to measure for infants with diarrhea; however, if

urinalysis is indicated, a finding of increased urine specific gravity can indicate dehydration.

The goal of assessment is to provide a starting point for treatment and to conservatively determine which patients can safely be sent home for therapy, which ones should remain for observation during therapy, and which ones should immediately receive more intensive therapy.

Symptoms associated with dehydration:

Minimal or no dehydration (<3% loss of body weight):

- Mental status - Well, alert
- Thirst - Drinks normally; might refuse liquids
- Heart rate - Normal
- Quality of pulses - Normal
- Breathing - Normal
- Eyes - Normal
- Tears - Present
- Mouth and tongue - Moist
- Skin fold - Instant recoil
- Capillary refill - Normal
- Extremities - Warm
- Urine output - Normal to decreased

Mild to moderate dehydration (3%–9% loss of body weight):

- Mental status – Normal, fatigued or restless, irritable
- Thirst - Thirsty; eager to drink
- Heart rate - Normal to increased
- Quality of pulses - Normal to decreased
- Breathing - Normal; fast
- Eyes - Slightly sunken
- Tears - Decreased
- Mouth and tongue - Dry
- Skinfold – Recoil in <2 seconds
- Capillary refill – Prolonged
- Extremities – Cool
- Urine output - Decreased

Severe dehydration (>9% loss of body weight):

- Mental status - Apathetic, lethargic, unconscious
- Thirst - Drinks poorly; unable to drink
- Heart rate - Tachycardia, with bradycardia in most severe cases
- Quality of pulses - Weak, thready, or impalpable
- Breathing - Deep
- Eyes - Deeply sunken
- Tears - Absent
- Mouth and tongue - Parched
- Skinfold – Recoil in >2 seconds
- Capillary refill – Prolonged; minimal

- Extremities – Cold; mottled; cyanotic
- Urine output - Minimal

Sources: Adapted from Duggan C, Santosham M, Glass RI. The management of acute diarrhea in children: oral rehydration, maintenance, and nutritional therapy. MMWR 1992;41(No. RR-16):1–20; and World Health Organization. The treatment of diarrhoea: a manual for physicians and other senior health workers. Geneva, Switzerland: World Health Organization, 1995.

Utility of Laboratory Evaluation

Supplementary laboratory studies, including serum electrolytes, to assess patients with acute diarrhea usually are unnecessary. Stool cultures are indicated in cases of dysentery but are not usually indicated in acute, watery diarrhea for the immunocompetent patient. However, certain laboratory studies might be important when the underlying diagnosis is unclear or diagnoses other than acute gastroenteritis are possible. For example, complete blood counts and urine and blood cultures might be indicated when sepsis or urinary tract infection is a concern.

Acute Gastroenteritis Therapy Based on Degree of Dehydration

Seven basic principles guide optimal treatment of acute gastroenteritis (see below).

1. Oral rehydration solutions (ORS) should be used for rehydration.
2. Oral rehydration should be performed rapidly (i.e., within 3–4 hours).
3. For rapid realimentation, an age-appropriate, unrestricted diet is recommended as soon as dehydration is corrected.
4. For breastfed infants, nursing should be continued.
5. If formula-fed, diluted formula is not recommended, and special formula usually is not necessary.
6. Additional ORS should be administered for ongoing losses through diarrhea.
7. No unnecessary laboratory tests or medications should be administered.

Source: Adapted from Sandhu BK. Practical guidelines for the management of gastroenteritis in children. J Pediatr Gastroenterol Nutr 2001;33(Suppl 2):S36–9.

More specific recommendations for treating different degrees of dehydration have been recommended by the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and the American Academy of Pediatrics (AAP) (see Table 2 in the original guideline document).

Treatment should include two phases: rehydration and maintenance. In the rehydration phase, the fluid deficit is replaced quickly (i.e., during 3–4 hours) and clinical hydration is attained. In the maintenance phase, maintenance calories and fluids are administered. Rapid realimentation should follow rapid rehydration, with a goal of quickly returning the patient to an age-appropriate unrestricted diet, including solids. Gut rest is not indicated. Breastfeeding should be continued at all times, even during the initial rehydration phases. The diet should be increased as soon as tolerated to compensate for lost caloric intake during the acute illness.

Lactose restriction is usually not necessary (although it might be helpful in cases of diarrhea among malnourished children or among children with a severe enteropathy), and changes in formula usually are unnecessary. Full-strength formula usually is tolerated and allows for a more rapid return to full energy intake. During both phases, fluid losses from vomiting and diarrhea are replaced in an ongoing manner. Antidiarrheal medications are not recommended for infants and children, and laboratory studies should be limited to those needed to guide clinical management.

Minimal Dehydration

For patients with minimal or no dehydration, treatment is aimed at providing adequate fluids and continuing an age-appropriate diet. Patients with diarrhea must have increased fluid intake to compensate for losses and cover maintenance needs; use of ORS should be encouraged. In principle, 1 mL of fluid should be administered for each gram of output. In hospital settings, soiled diapers can be weighed (without urine), and the estimated dry weight of the diaper can be subtracted. When losses are not easily measured, 10 mL of additional fluid can be administered per kilogram body weight for each watery stool or 2 mL/kg body weight for each episode of emesis. As an alternative, children weighing <10 kg should be administered 60–120 mL (2–4 ounces) ORS for each episode of vomiting or diarrheal stool, and those weighing >10 kg should be administered 120–240 mL (4–8 ounces). Nutrition should not be restricted (see Dietary Therapy).

Mild to Moderate Dehydration

Children with mild to moderate dehydration should have their estimated fluid deficit rapidly replaced. These updated recommendations include administering 50–100 mL of ORS/kg body weight during 2–4 hours to replace the estimated fluid deficit, with additional ORS administered to replace ongoing losses. Using a teaspoon, syringe, or medicine dropper, limited volumes of fluid (e.g., 5 mL or 1 teaspoon) should be offered at first, with the amount gradually increased as tolerated. If a child appears to want more than the estimated amount of ORS, more can be offered. Although administering ORS rapidly is safe, vomiting might be increased with larger amounts. Nasogastric (NG) feeding allows continuous administration of ORS at a slow, steady rate for patients with persistent vomiting or oral ulcers. Clinical trials support using NG feedings, even for vomiting patients. Rehydration through an NG tube can be particularly useful in ED settings, where rapid correction of hydration might prevent hospitalization. Although rapid intravenous (IV) hydration can also prevent hospital admission, rapid NG rehydration can be well-tolerated, more cost-effective, and associated with fewer complications. In addition, a randomized trial of ORS versus IV rehydration for dehydrated children demonstrated shorter stays in EDs and improved parental satisfaction with oral rehydration.

Certain children with mild to moderate dehydration will not improve with ORT; therefore, they should be observed until signs of dehydration subside. Similarly, children who do not demonstrate clinical signs of dehydration but who demonstrate unusually high output should be held for observation. Hydration status should be reassessed on a regular basis, and might be performed in an ED, office, or other outpatient setting. After dehydration is corrected, further

management can be implemented at home, provided that the child´s caregivers demonstrate comprehension of home rehydration techniques (including continued feeding), understand indications for returning for further evaluation, and have the means to do so. Even among children whose illness appears uncomplicated on initial assessment, a limited percentage might not respond adequately to ORT; therefore, a plan for reassessment should be agreed upon. Caregivers should be encouraged to return for medical attention if they have any concerns, if they are not sure that rehydration is proceeding well, or if new or worsening symptoms develop.

Severe Dehydration

Severe dehydration constitutes a medical emergency requiring immediate IV rehydration. Lactated Ringer´s (LR) solution, normal saline, or a similar solution should be administered (20 mL/kg body weight) until pulse, perfusion, and mental status return to normal. This might require two IV lines or even alternative access sites (e.g., intraosseous infusion). The patient should be observed closely during this period, and vital signs should be monitored on a regular basis. Serum electrolytes, bicarbonate, blood urea nitrogen, creatinine, and serum glucose levels should be obtained, although commencing rehydration therapy without these results is safe. Normal saline or LR infusion is the appropriate first step in the treatment of hyponatremic and hypernatremic dehydration. Hypotonic solutions should not be used for acute parenteral rehydration.

Severely dehydrated patients might require multiple administrations of fluid in short succession. Overly rapid rehydration is unlikely to occur as long as weight-based amounts are administered with close observation. Errors occur most commonly in settings where adult dosing is administered to infants (e.g., "500 mL NS [normal saline] IV bolus x 2" would provide 200 mL/kg body weight for an average infant aged 2– 3 months). Edema of the eyelids and extremities can indicate overhydration. Diuretics should not be administered. After the edema has subsided, the patient should be reassessed for continued therapy. With frail or malnourished infants, smaller amounts (10 mL/kg body weight) are recommended because of the reduced ability of these infants to increase cardiac output and because distinguishing dehydration from sepsis might be difficult among these patients. Smaller amounts also will facilitate closer evaluation. Hydration status should be reassessed frequently to determine the adequacy of replacement therapy. A lack of response to fluid administration should raise the suspicion of alternative or concurrent diagnoses, including septic shock and metabolic, cardiac, or neurologic disorders.

As soon as the severely dehydrated patient's level of consciousness returns to normal, therapy usually can be changed to the oral route, with the patient taking by mouth the remaining estimated deficit. An NG tube can be helpful for patients with normal mental status but who are too weak to drink adequately. Although no studies have specifically documented increased aspiration risk with NG tube use in obtunded patients, IV therapy is typically favored for such patients. Although leaving IV access in place for these patients is reasonable in case it is needed again, early reintroduction of ORS is safer. Using IV catheters is associated with frequent minor complications, including extravasation of IV fluid, and with rare substantial complications, including the inadvertent administration of inappropriate fluid (e.g., solutions containing excessive potassium). In addition,

early ORS will probably encourage earlier resumption of feeding, and data indicate that resolution of acidosis might be more rapid with ORS than with IV fluid.

Clinical Management in the Hospital

Inpatient care is indicated for children if:

- caregivers cannot provide adequate care at home
- substantial difficulties exist in administrating ORT, including intractable vomiting, ORS refusal, or inadequate ORS intake
- concern exists for other possible illnesses complicating the clinical course;
- ORS treatment fails, including worsening diarrhea or dehydration despite adequate volumes
- severe dehydration (>9% of body weight) exists
- social or logistical concerns exist that might prevent return evaluation, if necessary
- such factors as young age, unusual irritability or drowsiness, progressive course of symptoms, or uncertainty of diagnosis exist that might indicate a need for close observation

In addition, studies of mortality caused by acute diarrhea in the United States have identified prematurity, young maternal age, black race, and rural residence as risk factors for suboptimal outcome; thus, these factors should also be considered when deciding if hospital care is required.

Limitations of ORT

Although ORT is recommended for all age groups and for diarrhea of any etiology, certain restrictions apply to its use. Refer to the "Potential Harms" and "Contraindications" fields for more information.

Hypernatremic Dehydration

Patients with hypernatremic dehydration (i.e., serum sodium concentration >145 mEq/L) respond well to ORT. Those with severe dehydration should first receive IV hydration as previously discussed. Subsequent hydration should be achieved with ORS. As with isonatremic dehydration, ORS should be administered to replace the calculated deficit and ongoing losses. ORS might be safer than IV therapy because it is less likely to lead to a precipitous increase in intracellular water associated with seizures and elevated intracranial pressure. For more detailed recommendations regarding therapy of hypernatremic dehydration, other sources should be consulted.

Dietary Therapy

Recommendations for maintenance dietary therapy depend on the age and diet history of the patient. Breastfed infants should continue nursing on demand. Formula-fed infants should continue their usual formula immediately upon rehydration in amounts sufficient to satisfy energy and nutrient requirements. Lactose-free or lactose-reduced formulas usually are unnecessary. A meta-analysis of clinical trials indicates no advantage of lactose-free formulas over

lactose-containing formulas for the majority of infants, although certain infants with malnutrition or severe dehydration recover more quickly when given lactose-free formula. Patients with true lactose intolerance will have exacerbation of diarrhea when a lactose-containing formula is introduced. The presence of low pH (<6.0) or reducing substances (>0.5%) in the stool is not diagnostic of lactose intolerance in the absence of clinical symptoms. Although medical practice has often favored beginning feedings with diluted (e.g., half- or quarter-strength) formula, controlled clinical trials have demonstrated that this practice is unnecessary and is associated with prolonged symptoms and delayed nutritional recovery.

Formulas containing soy fiber have been marketed to physicians and consumers in the United States, and added soy fiber has been reported to reduce liquid stools without changing overall stool output. This cosmetic effect might have certain benefits with regard to diminishing diaper rash and encouraging early resumption of normal diet but is probably not sufficient to merit its use as a standard of care. A reduction in the duration of antibiotic-associated diarrhea has been demonstrated among older infants and toddlers fed formula with added soy fiber.

Children receiving semisolid or solid foods should continue to receive their usual diet during episodes of diarrhea. Foods high in simple sugars should be avoided because the osmotic load might worsen diarrhea; therefore, substantial amounts of carbonated soft drinks, juice, gelatin desserts, and other highly sugared liquids should be avoided. Certain guidelines have recommended avoiding fatty foods, but maintaining adequate calories without fat is difficult, and fat might have a beneficial effect of reducing intestinal motility. The practice of withholding food for ≥24 hours is inappropriate. Early feeding decreases changes in intestinal permeability caused by infection, reduces illness duration, and improves nutritional outcomes. Highly specific diets (e.g., the BRAT [bananas, rice, applesauce, and toast] diet) have been commonly recommended. Although certain benefits might exist from green bananas and pectin in persistent diarrhea, the BRAT diet is unnecessarily restrictive and, similar to juice-centered diets, can provide suboptimal nutrition for the patient´s nourishment and recovering gut. Severe malnutrition can occur after gastroenteritis if prolonged gut rest or clear fluids are prescribed.

Children in underdeveloped countries often have multiple episodes of diarrhea in a single season, making diarrhea a contributing factor to suboptimal nutrition, which can increase the frequency and severity of subsequent episodes. For this reason, increased nutrient intake should be administered after an episode of diarrhea. Recommended foods include age-appropriate unrestricted diets, including complex carbohydrates, meats, yogurt, fruits, and vegetables. Children should as best as possible maintain caloric intake during acute episodes, and subsequently should receive additional nutrition to compensate for any shortfalls arising during the illness.

Pharmacologic Therapy

Antimicrobial Agents

Because viruses (e.g., rotavirus, astrovirus, enteric adenovirus, norovirus, and sapovirus) are the predominant cause of acute diarrhea in developed countries,

the routine use of antimicrobial agents for treating diarrhea wastes resources and might lead to increased antimicrobial resistance. Even when a bacterial cause is suspected in an outpatient setting, antimicrobial therapy is not usually indicated among children because the majority of cases of acute diarrhea are self-limited and not shortened by antimicrobial agents. Exceptions to these rules involve special needs of individual children (e.g., immune-compromised hosts, premature infants, or children with underlying disorders). Information regarding appropriate antimicrobial therapy of bacterial and parasitic causes of acute infectious diarrhea is available.

Nonantimicrobial Drug Therapies

Nonspecific antidiarrheal agents (e.g., adsorbents such as kaolin-pectin), antimotility agents (e.g., loperamide), antisecretory drugs, and toxin binders (e.g., cholestyramine), are commonly used among older children and adults, but data are limited regarding their efficacy. Side effects of these drugs are well-known, in particular among the antimotility agents, including opiate-induced ileus, drowsiness, and nausea caused by the atropine effects and binding of nutrients and other drugs. Because acute diarrhea is a common illness, cost-effective analyses should be undertaken before routine pharmacologic therapy is recommended.

Supplemental Zinc Therapy

A number of trials have supported zinc supplementation as an effective agent in treating and preventing diarrheal disease. Further research is needed to identify the mechanism of action of zinc and to determine its optimal delivery to the neediest populations. The role of zinc supplements in developed countries needs further evaluation.

Functional Foods

Functional foods can be defined as foods that have an effect on physiologic processes separate from their established nutritional function. Probiotics have been defined as live microorganisms in fermented foods that promote optimal health by establishing an improved balance in intestinal microflora. Because dietary supplements (e.g., probiotics) are usually not regulated by the federal government, potential exists for great variability among them, providing a challenge to the prescribing physician to make an informed recommendation regarding their use.

Prebiotics differ from probiotics in that they are complex carbohydrates rather than organisms used to preferentially stimulate the growth of health-promoting intestinal flora. Specific recommendations regarding their use should await further well-controlled human trials.

Specific Clinical Scenarios

Oral rehydration therapy is critical in managing specific types of diarrheal diseases.

Acute Bloody Diarrhea (Dysentery)

Dysentery is defined as acute bloody diarrhea caused by invasive microbial infection. This does not include occult blood (detected by guaiac card only) or streaks of blood on the surface of formed stool. The treatment of dehydration in dysentery follows the same principles as treatment of acute watery diarrhea. The child with bloody diarrhea is at higher risk for complications, including sepsis and other systemic diseases; therefore, the threshold for admission of such children to the hospital for close observation is lower. Stool cultures are indicated in the setting of acute bloody diarrhea and are helpful for guiding therapy. Food should not be withheld for children with dysentery any more than in other cases of diarrhea. More frequent, smaller meals might be better tolerated, and higher protein intakes have proven beneficial among children recovering from dysentery.

In the majority of cases, empiric antimicrobial agents should not be administered while awaiting culture results, because antimicrobial therapy might not be indicated even when culture results are positive. Amoebiasis is an unusual cause of bloody diarrhea in young children, even in less-developed countries. Treatment for amoebiasis should be reserved for those cases in which trophozoites are detected on microscopic examination of the stools. Recommendations for therapy of specific enteric pathogens associated with bloody diarrhea are available elsewhere.

Persistent Diarrhea and Diarrhea with Severe Malnutrition

These clinical entities are critical, especially among children of developing countries. Therapy should include oral rehydration when indicated, although the specifics of the evaluation, and fluid, electrolyte, and nutritional management differ and are beyond the scope of this review. The reader is referred to other sources for information regarding these conditions.

Choice of ORS

On the basis of recent clinical research, the United Nations Children's Fund (UNICEF) and WHO organized a consultation on oral rehydration that recommended a reduced osmolarity solution for global use. In May 2002, WHO announced a new ORS formulation consistent with these recommendations, with 75 mEq/L sodium, 75 mmol/L glucose, and total osmolarity of 245 mOsm/L (see Table 3 in the original guideline document). The newer hypotonic WHO-ORS is also recommended for use in treating adults and children with cholera, although postmarketing surveillance is under way to confirm the safety of this indication. The composition of commonly available oral rehydration solutions is distinct from other beverages frequently used inappropriately for rehydration.

New Solutions

Recipes to improve ORS have included adding substrates for sodium co-transport (e.g., the amino acids glycine, alanine, and glutamine) or substituting complex carbohydrates for the glucose (rice and other cereal-based ORS).The amino acid preparations have not been demonstrated to be more effective than traditional ORS, and they are more costly. Rice-based ORS can be recommended where training is adequate and home preparation is preferable, and it can be particularly

effective in treating dehydration caused by cholera. Nevertheless, given the simplicity and safety of ORS packets in developing countries and of commercially available ORS in developed countries, these remain the first choice for the majority of clinicians.

Other potential additives to ORS include substances capable of liberating short-chain fatty acids (e.g., amylase-resistant starch derived from corn) and partially hydrolyzed guar gum. The presumed mechanism of action is the enlistment of increased colonic sodium uptake coupled to short-chain fatty acid transport. Other possible future ORS composition changes include addition of probiotics, prebiotics, zinc, or protein polymers.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

If the principles of therapy outlined in this report are accepted by all levels of the medical community and if education of parents includes teaching them to begin oral rehydration therapy (ORT) at home, numerous deaths and unnecessary clinic visits and hospitalizations can be avoided. ORT is suitable for use among children throughout the world.

POTENTIAL HARMS

Limitations of Oral Rehydration Therapy (ORT)

- Stool output in excess of 10 mL/kg body weight/hour has been associated with a lower rate of success of oral rehydration; however, children should not be denied ORT simply because of a high purging rate, because the majority of children will respond well if administered adequate replacement fluid.
- A limited percentage of infants (<1%) with acute diarrhea experience carbohydrate malabsorption. This is characterized by a dramatic increase in stool output after intake of fluids containing simple sugars (e.g., glucose), including oral rehydration solutions (ORS). Patients with true glucose malabsorption also will have an immediate reduction in stool output when intravenous (IV) therapy is used instead of ORS. However, the presence of stool-reducing substances alone is not sufficient to make this diagnosis, because this is a common finding among patients with diarrhea and does not in itself predict failure of oral therapy.

- Certain patients with acute diarrhea have concomitant vomiting. However, the majority can be rehydrated successfully with oral fluids if limited volumes of ORS (5 mL) are administered every 5 minutes, with a gradual increase in the amount consumed. Administration with a spoon or syringe under close supervision helps guarantee a gradual progression in the amount taken. Often, correction of acidosis and dehydration lessens the frequency of vomiting. Continuous slow nasogastric (NG) infusion of ORS through a feeding tube might be helpful. Even if a limited amount of emesis occurs after NG administration of fluid, treatment might not be affected adversely. The physician might meet resistance in implementing NG rehydration in a vomiting child, but NG rehydration might help the initial rehydration and speed up tolerance to refeeding, leading to improved patient disposition and quicker discharge.

Overly Rapid Rehydration

Among patients with severe dehydration, overly rapid rehydration is unlikely to occur as long as weight-based amounts are administered with close observation. Errors occur most commonly in settings where adult dosing is administered to infants (e.g., "500 mL NS [normal saline] IV bolus x 2" would provide 200 mL/kg body weight for an average infant aged 2–3 months).

CONTRAINDICATIONS

CONTRAINDICATIONS

Among children in hemodynamic shock, administration of oral solutions might be contraindicated because airway protective reflexes might be impaired. Likewise, patients with abdominal ileus should not be administered oral fluids until bowel sounds are audible. Intestinal intussusception can be present with diarrhea, including bloody diarrhea. Radiographic and surgical evaluations are warranted when the diagnosis of bowel obstruction is in question.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

King CK, Glass R, Bresee JS, Duggan C. Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy. MMWR Recomm Rep 2003 Nov 21;52(RR-16):1-16. [114 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2003 Nov 21

GUIDELINE DEVELOPER(S)

Centers for Disease Control and Prevention - Federal Government Agency [U.S.]

SOURCE(S) OF FUNDING

United States Government

GUIDELINE COMMITTEE

Not stated

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Authors: Caleb K. King, MD, University of North Carolina, Chapel Hill, North Carolina; Roger Glass, MD, PhD, Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention; Joseph S. Bresee, MD, Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention; Christopher Duggan, MD, Children´s Hospital Boston, Boston, Massachusetts

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

ENDORSER(S)

American Academy of Pediatrics - Medical Specialty Society

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the Centers for Disease Control and Prevention (CDC) Web site:

- HTML Format
- Portable Document Format (PDF)

Print copies: Available from the Centers for Disease Control and Prevention, MMWR, Atlanta, GA 30333. Additional copies can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; (202) 783-3238.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on June 30, 2004.

COPYRIGHT STATEMENT

Date Modified: 11/8/2004